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TRANSLATION NO. 1444

DATE: 1952

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T-336-2

CONDITIONS OF THE CULTURE OF RICE
IN THE HIGH&DONNAI (Vietnam)

by
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L'Agronomie Tropicale 7(3): 266-75, 1952

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CONDITIONS OF THE CULTURE OF RICE IN THE HIGH-DONNAI (Vietnam)

The notes which follow, were taken in the course of an inquest carried out in the region of Djiring and of Blao in 1943.

The possibilities of transport, excessively reduced following the war, even in consenting very elevated prices, cruelly put in evidence a weakness of the economy of these regions.

In addition autonomous mountaineer tribes, the High-Dannoi had to nourish about twenty thousand immigrants, farmers, artisans, workers and their families, natives of Vietnam, above all of North Vietnam. Gross consumer of rice, this population did not produce it.

This surplus of consumption did not cause, or affect the augmentation of the production of the mountaineers. On thought even, wrong or right, that the local production had to the contrary diminished.

Opinion had it that the local seedings were "deteriorated" and that it would have sufficed to replace them to see the production greatly increased. They waited the action of the agricultural services for this sort of miracle.

TRADITIONAL CULTURES OF THE MOUNTAINEERS

Reserve made of the "case cultures", that only occupy minimum surfaces in the immediate accesses of the habitations, one remarks, at first sight, that the mountaineer cultures divide themselves on three levels:

- a) rice fields which occupy the bottom of the valleys, visibly flattened, dammed and irrigated;
- b) fields that one meets on gentle slopes, at the flank of hills and of rounded hills, toward the base of mountains;
- c) genuine forested "felling areas", of geometric contours, that one sees on the elevated banks, in the neighborhood of ridges.

These three levels of culture are the result of three different ethnic groupings. Each tribe, and they are numerous, has its traditions, its own methods, to which it is always very attached.

It is thus in the Djiring region:

The Sholsra live in fixed villages, cultivate above all the valleys by the inundated rice field method, practice very little "ray" (1), always close to the village and only as a balance culture. Apart from the miniscule gardens, they cultivate only rice.

The Ilis are great nomads. They practice uniquely the ray on elevated slopes. They fight with great work the huge forest, burn it and cultivate the terrain for as long as possible. When the soil becomes depleted and the yields drop, they abandon it and start over further on. They never return to the same place, but if they do return at all much later on, it is when the forest is completely reconstituted. The villages thus are subjected in the long run to considerable displacements. They produce both rice and maize, arriving in this way at two crops in the same year. They are well nourished, strong and hardy; they are excellent lumbermen and great burners of forests.

The Ma have their habitat at the foot of the mountains and cultivate the gentle slopes. They cut down and burn the forest, and make, in its place, rice during two consecutive years or three at the most. The ray is then abandoned during ten to thirty years, after which the same village cultures it again.

They act in a way analogous in respect to a few small valleys, that they treat in inundated rice field, and abandon after the yield lowers to there return later on. There is thus established a rotation that makes alternate, in a vast perimeter, a brief culture with a long fallow according to a more or less constant cycle. Certain ceremonies, that return every twenty-one years, tend to make one think that such is the period of it, at least in principle.

The habitations deplace themselves with the cultures on the interior of the same perimeter, that the village considers as the territory that belongs to the clan.

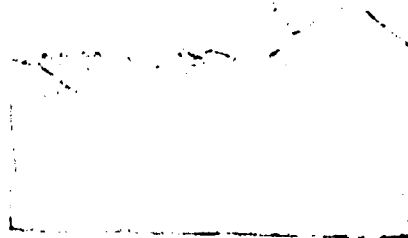
The villages of this tribe cultivate, spin and weave an annual cotton or use certain fibers, quite analogous to the hemp, that it finds in the forest. The Ma have, near the habitations, gardens of a certain importance.

It is quite remarkable that the three groups overlap or enclose themselves without becoming mingled and without provoking disputes: each has his field of action different from those of the others.

(1) "Ray" Indochinese term designating, in the mode of itinerant culture, the field of culture prepared by fire.

CULTURE OF THE RICE FIELDS

The rice fields of Cholsra show ancient and very perfected management. They occupy the bottom of the valleys and along their borders, forming there classical steps, solid dikes and divide them in very small sets of pigeonholes, rigorously horizontal. The dikes are often ^{small} and manage between them a canal, that serves either for irrigation, or for drainage. The rivers and streams are blocked, diversion canals conduct the water upstream to the rice fields; the canalizations often follow a course of several kilometers in winding around groups to irrigate secondary channels, or else collect, to the benefit of a small rice field, water from a spring or of neighboring streams.



High Donnai (Vietnam)
Village and bute

The semi-temporary rice fields of the Ma are managed in a more concise manner.

The first and the others give very careful methods. The first labors are carried out, when the first stormy rains of the season have well soaked the soil, that is to say in May-June; then they repair the dikes and the canals. During this time the rainy season establishes itself and the water courses have acquired a sufficient supply, so that one can be assured of irrigating at will. The rice fields are watered and given a second labor, often crossed, about a month after the first one; then, they harrow for a long time by method of a strong hitched rake, with receding tooth, until it gives the soil the consistency of a fine liquid mud; this mud is again relaxed and at the same time flattened by passing over it a great ladder hitched by its two extremities.

The seeding is done quite soon after, on this very fine mud, semi-liquid and of perfectly flat surface, recovered with a water bed of about 5 cm. To begin with they make the grains germinate by soaking them in water for two or three nights, taking them out during the day. The seeding is done directly in place, at random and by hand, by four consecutive passages of seeders, thus emulating the tradition. If there is a shortage of seeds, they only do three passages, but they know when the harvest will be less good and when the bad grasses will invade the rice field. The amount is from 80 to 100 kg of seed.

The water is evacuated slowly five days after the sowing. It is introduced with precaution when the plants attain 10 to 15 cm; they maintain it, during the entire vegetation, at a level in relationship with the height of the plants; they never dry it, even at the time of maturation.

When it is possible, as is very often the case, the water is renewed without stopping.

The upkeep of the canals, the admission and evacuation of the water are the object of a daily surveying on the part of the Cholsre.

It often happens that the rice fields closest to the water courses are inundated by a flood; these inundations are always very brief, one does not protect himself against it and the culture hardly suffers at all; often it even seems to receive a whiplash.

The date of the harvest varies according to the cultivated varieties. It is done in cutting the high-grown transplanted at the sickle, all as in the deltas of Vietnam. Small quantities are soon tread out by foot; but the bulk of the crop, that takes place in January-February, is cut in sheaves and in heaps, that are tread out by buffalo feet afterwards. The pending harvests and the stacks attract the stags and above all the wild boars, which

Bark-Chu (Vietnam)
Rice harvest by the
mountainers

calls for fences and a continual supervision until the end of the threshing.

The yields are generally good: one to two tons, with an average of about 1,500 kg per hectare. But a few used up rice fields exist. This is the case even in the small valley of Djiring; there, it is rare to attain 1,000 kg of paddy per hectare; it is frequent to have less than 500 or even 300 kg, the average staying in the neighborhood of 500 kg. per hectare.

The rice fields in the environs of Djiring and of Ilco show mixtures of several phenotypes, yet the cultivators englobe them all under a small number of names, attaching importance only to the duration of evolution and distinguish on that account their rice into three categories:

- a) ordinary rice, whose duration of evolution is about six moons and more,
- b) hasty rice, of three and one-half moons and of four moons,
- c) rices, whose name implies an idea of dryness, of the sort that they can be sown dry season rice.

It is hardly easy to obtain precision on the date of cultural events, as the Djiring mountaineers or of Ilco do not have a calendar. It is these events themselves that on the contrary serve them as points of chronological time.

They attach much importance to the moon, that count the days of a new moon to the following one in numbering them: this care is delegated to the old people "who do not sleep at night". But, in order to situate the lunations, they do not enumerate them, they relate them to natural events. For them "the first moon after the beginning (or the end) of the rains", "the moon, where such animal emits the cry of loves (or of the laying of eggs or of the throwing (young)...)", "the moon of such and such fruit or flower" constitute quite clear definitions and besides perfectly adapted to their occupations. The years are counted by the number of harvests and begin, in principle, with the first moon, that follows the harvest: this last one is the occasion, naturally, of a ritual ceremony, but it does not take place the same day in all of the villages, nor even in all of the families. They do not even notice that, in this way, twelve lunations go by from the beginning of one year to the next or to the contrary thirteen.

Ceremonies celebrate, by "sacrifice to the spirits", the "seeds", the "beginning of the formation of the grain", "the complete formation of the grain", the "end of the harvest" — ceremony already spoken of — and finally "the grain in the granary", which takes place in the second moon of their year. A single solemn ceremony is regular, but it does not serve so much for the origin of weather, it is the great festival of Tabou of the Earth, "Wer gung"; it takes place, always and everywhere, the same day: the seventh and the third moon after the harvest.

That is the situation of each rice field with regard to water, which determines only in fact the dates of seeding, of harvest, and, consequently, the use of such or such seed, even though one knows, for example, that the rice has a short cycle and only has a yield of two thirds of that of ordinary rices.

Those last mentioned are used by preference and one finds them everywhere in general, where their vegetation is assured, from the second moon of the rainy season, towards our month of July, right until the end of this same season, around January-February.

The rices of three and one-half moons and of four moons is seeded at the same moment in the rice fields, that run the risk of lacking water at the end of the season, one harvests them from about November.

The rices of the "dry season" serve to sow: either early, the rice fields that have water before the establishment of the rains, and that will be harvested before a probable inundation, or tardy, after inundation often, those that can be irrigated again after the rainy season; or finally all of those that could not be sown at the normal weather or time, for what reason have you.

One designates by the name of "Koe Me", that is translated "mother rice", the most cultivated rice of the village, a principle phenotype mixed with 40 or 50 % of others of the same calendar.

A few rice fields, reputed to be the best ones and belonging to well off gentlemen, carry a little later rice, by about ten days, appreciated for its color and for its taste, that is called "Koe Bo" (white rice) or "Koe Yoon" (annamite rice). The term "Koe Phang" designates the ensemble of early ripe rices.

CULTURE OF THE RAYS

That which we call "ray", from the annamite name, is called a "mir" in Koho language.

The location of these new rays is chosen by the village chief and the sorcerer, according to rules and traditional signs. Certain places are recognized taboos and must be spared and even protected. The result of these deliberations is, in large, the following: avoid too little fertile zones and those, where the brush would have too much trouble reconstituting itself, make the most of the interior of uprootings, particularly on top of the slopes, thickets and windbreaks favorable to ulterior reconstitution.

According to the local conditions, the village traditions and also new or accidental circumstances, the reclaimed brush is a true forest, a pole wood hardly reconstituted, a thicket, in truth a more or less woody savannah. The cutting is done in full dry season, around January-February. Everything that is cut is left in place for about two months. They put fire to it one month before the rains.

This burning seems to have great importance, the mountaineers hold to it to a great extent, and we have stated, at the experimental station at Blee, that the trial cultures of vegetables and of grasses, made on newly reclaimed terrain, marked a very strong superiority to the places, where a part of the reclaiming materials had been ascribed in swaths and burned.

The soil thus cleaned, and perhaps improved by the burning, is returned to the hoe. Only the Chohre, who do not practice rays or only exceptionally on extremely slight slopes, use the plow.

The seeds are sown a little earlier than in the rice field, in the second moon of the rainy season, that is to say towards May or June, one of the extreme importance to the phase of the moon, the tradition claiming that that which is seeded, before the third or after the seventeenth

ray of the moon, should not succeed; it is a fact that the hindrance to the seed has an enormous effect on the yield.

When the slope is slight they seed at random. But, but after it is slightly more sloped, a cultivator arms himself with two long sticks, with which he digs a hole with each step that he takes, from one edge to the other edge of the field, another one follows him, who puts three or four grains in the holes and closes them up with a kick of the foot, one thus obtains regularly spaced and well aligned pockets.

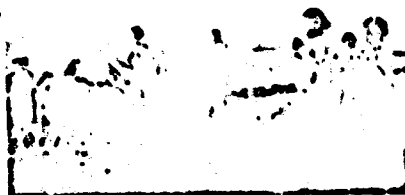
The seeds are numerous, one repeats the weeding without stopping up until the flowering.

The more premature varieties, say from three and four moons, are harvested from September or October; the most cultivated ones, say of six moons, are harvested in November-December.

Nearly all of the ray varieties shall with extreme facility, one does not cut the stems, one simply separates the grains of the panicles with the hand.

The rays generally give excellent yields. In rich earth, well prepared, well weeded, they often produce 3 tons and more of paddy per hectare; but a bad culture, due to a tardy seeding, defoliated by the weeds, falls very quickly, for less than 500 kg. The general average is notably superior to 1,500 kg. per hectare.

Certain particularly fertile valleys, but arid, the rays pass for being more productive than the rice fields, which is not meant to surprise.



High Doanai (Vietnam)
Treeding of the paddy by the buffalo

The mountaineers distinguish the numerous varieties of ray rice, as much by the aspect and taste as by the duration of evolution. Their names are often the same as those of rices from the rice fields, but there is no identity nor analogy.

The "Koe-Mo" (mother rice), is sown first, by tradition, and is harvested six months later, near the end of November. It is the most widespread, it produces much when the soil is good.

One also finds a "Koe Bo" (white rice), different from the Koe Mo of the rice field. It perceptibly has the same slender as the Koe Mo and is preferred to it in certain villages.

The "Koo Mom" (smoked rice) has black glumellas. It also has the same calendar, it is quite wider, redd, although little appreciated, it is often cultivated in mixture with the others.

The "Koo Rhin" (the rice son (?)) is tardier by a few days. One appreciates its taste.

The "Koo Brang" (red rice) is the most premature of the seasonal rice.

The "Koo Ke" (rice from the vice field) is thus named because it looks like this last mentioned, its barbs are very short, it doesn't shell, it is harvested by cutting the stem and by treading out.

The "Koo Non" is a premature rice, seeded one moon after the others, it is harvested from November on. It passes for a big producer.

The "Koo Frang" is a four moons rice, of fixed evolution duration, it is harvested prematurely or is sown late.

The "Koo Frang Re" (rice with loose panicles) is another four moons rice.

Another "Koo Frang" (rice of the dry season) is very premature, the first cultivated and harvested; its taste is little appreciated, but "it ferments well in jars".

Just as in the rice field, each cultivator grows a minimum quantity of starchy rice, or "Koo :Bar", for the celebration of ceremonies and of ritual cakes. Numerous varieties of Koo :Bar, of ray and of rice field exist.

All of these varieties of rice from dry terrain are barbed.

One does not cultivate one variety rather than another, on a new ray or on an old ray of two or three years: one observes no adaptation at a more or less advanced degree of impoverishment of the soil.

The notion of the improvement of the ray must be considered with a certain reserve: the rays are progressively invaded by the annual vegetation from their second year of culture, the decline of yield is due to this invasion as much as to the fall of the fertility, and, the culture difficulties being added, the ray is abandoned well before it is really exhausted.

In ray as in rice field, the situation of the more or less vast glades which form the cultures in the middle of the wild brush, necessitates

particular care in order to avoid the damage of fallow deer and birds. Quite early, one establishes a barrier with thorny branches and bamboos, one constructs miradors and ingenious noise maker apparatus controlled at a distance, one establishes traps. What would not impede the birds, the stags and above all the wild boars to commit enormous damage, were it not for an almost continual vigilance, that requires the presence of the cultivators on their field, every day, from the planting up until the time where the grain is inclosed in the granaries.

Observations

It is an often received opinion that the mountaineers are lazy and mediocre cultivators, less good, in any case, than those of the plains and the deltas. I came back convinced of the contrary: they are careful and gifted cultivators in the "earthy sense". Relative to their mode of life and to their ways they are not far from what in their place we would call "full usage". If their productivity per man or per hectare is small, it is due to their technological level that we must attribute it.

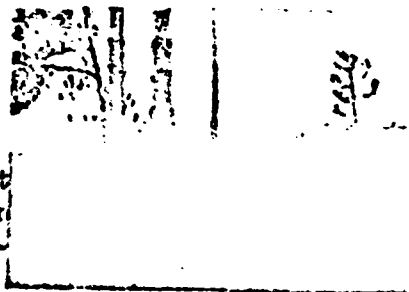
They work their soils with great care, sow the grains carefully, gathered up and conserved for this reason, keep up their maintenance work, they interrupt their work only after "the grain is in the granary", but then, on their own vow, they "rest themselves" until the following culture, besides they have nothing else to do. They faithfully observe the precise traditional rules and quite judicial ones they are, and merit no accusation of laziness.

It is true that from this activity and this care depend their existence even the survival of the tribes; they are intimately tied and blended in their mode of life. One cannot forget to notice the perfection of the adaptation, and also how much the mountaineers's agriculture, above all, than of the rays, with its rotation, its fallow land, its rules both strict and diverse, enhances more than a genuine "agricultural technique" as the very routine and simple "rice growing practice" of the deltas.

I had the chance, in other circumstances, of verifying the faculty that the mountaineers have to adapt and "understand" the methods and means of modern work, it is greater with them than with the rice growers of the plain; but the fault of this system, where life and work are so completely adapted one to the other, is its absence of flexibility. It was fatal that all disturbances compromised the equilibrium of it.

The enhanced value of the High Plateaus, effectuated in some measure from the exterior, could not avoid bringing trouble.

It requires important needs of manual labor; a great part of it is supplied by immigration, that introduces a surplus of population relatively considerable in relation to the number of natives, from which the accrued life needs. One could not expect that the traditional industry of the mountaineers be in measure of growth of their production in an analogous proportion: being given the organization of their economy, a rise in prices, even very important, could not induce an augmentation of the production.



High Donnai (Vietnam)
Langbiang Plateau

Is it necessary to note that measures, such as the replacement of traditional seeds, even if it had been possible without requiring researches and adjustments always quite long, or the introduction of other "methods" would not have sufficed to resolve the question.

It happens also that the imported manual labor does not permit to face all of the needs in certain peak periods: the upkeep of the roads and trails for one thing, as well as some constructions, harvest jobs in the plantations, above all the coffee trees on the other hand, require the intervention of native workers, that one searches to procure, by manoeuvres that one can call "of seduction": elevated salaries, attribution of rice rations superior to the immediate needs, in truth even the bait of alcohol and festivals. It well seems that the deductions in advance effectuated on the traditional work of the mountaineers had unlucky effects on their production, effects not in proportion with the number of days.

Some mountaineers are definitely turning away from their villages, above all to the neighborhood of cities and centers of Vietnamese colonization, these people only weigh down the consumption.

The needs of supplementary manual labor are placed above all at the beginning of the dry season at the time where the mountaineers prepare and carry out their own harvest; now, the mutual aid and exchange of days, that are the rule for the execution of methods and of sowing, do not play for the water supervision, the enclosure of the fields, the protection of pending harvests or from predatory beasts: an absence of a few days at this point has grave consequences.

It is to these facts that it is necessary to attribute the complaints, that greet the appeals of manual labor in the villages. It is difficult to appreciate the losses that really result from it, but the discouraging psychological effect is certain, and even more, if important endowments

of rice create the impression that the life work is earned more quickly and with less hardship than by traditional works.

A less spectacular trouble, but a deeper one, rises from the installation of plantations on the best soils. These plantations deduct a portion of territories of traditional culture from the villages, or else they reduce the surface on which they practice their rotation, and the fallow land finds itself abridged, or else, they fall back outside of traditional courses, to the research of new soils, and it is necessary to fear while the acquired experience, that had guaranteed the fertility of developed soils and their possibility of reconstitution after culture, is put in misuse.

Without doubt the habitual regulatory inquiries were made to assure that the land newly sold was "free"; but the idea even of culture and fixed installation, perennials being inconceivable to the mountaineers, they could not foresee that the zones, unoccupied at the time of the investigations, would be withdrawn from their activity, when the time came for them to put the lands back into culture.

That would explain the importance of the wastes, that one had thought had contributed in the course of the past years, to the culture methods of the mountaineers. As it seemed difficult to admit, without serious reserves, the fact that their itinerant cultures normally tend to completely deforest the mountainous regions. Granted, the spectacle of barren slopes, the high forest sacrificed to the culture of a few years, can not leave one indifferent and the losses that one dreads from deforestation commands a wise prudence.

Nevertheless one cannot refrain from asking himself how the mountains submitted to this kind of culture, truly, or seemingly, for centuries, still have beautiful forests if they are not "reconstituted", unless one supposes that a new cause, quite recent, had augmented unexpectedly the deforestation. This cause can hardly be an augmentation in number of the mountaineers or of their needs.

The extension of the rays, at least the recent uprootings of the great forests are verified, however. If one must believe those that have known and traveled the country for about twenty years, he is left with the impression of an active deforestation. But of what value are these pretended verifications? Only an objective observation, continued for several 5-year periods, on a minimum of thirty forests, could give a positive idea of the progress or of the perseverance of the deforested surfaces.

Aerial photographs, interested in very vast surfaces, and repeated from five to five years, permitted to observe the shiftings and the eventual

progress of the deforestation. The most favorable moments for the execution of the plots are either that of the labors and young rays, in May-June, or that of the maturity before the November harvest.

This does not make it less real that the rays method is a spoiling of surface, of vegetal material and of manual labor.

The installation of colonization cultures, plantations or small Vietnamese colonies, does not bring a real remedy to this situation, unless one admits that they will eliminate the traditional cultures, with the elimination of the tribes that practice them.

The colonization of a part of the territory and the maintenance at the same time of the ancestral culture of the mountaineers, without precautions and without concomitant or even preliminary managements, can have for effect only that of rendering this last one more precarious, to accuse the inconveniences of it and to augment, if not to create, sterile conditions that one would dread. All the more when these effects add to an accrued proliferation of natives as a result of the amelioration of their sanitary state.

It is necessary to conduct these regions to an equilibrated economy in its entirety, to install systems of susceptible cultures, at the same time to nourish and to employ the tribes on location, in elevating their level of life and without brusquely upsetting their customs and their traditions—but in utilizing them—at the same time as remunerating imported chiefs and manual labor for exportable productions.

By reason of wise economy of the soil and prudence, as well as by a psychological necessity, rice must not be excluded from the plateau cultures; even when it would seem more practical to buy it in the delta (remember that wheat remains a base culture in France, even if "its culture does not pay").

The perennial industrial cultures, that appeared, to concentrate the interest, do not realize themselves alone a good utilization of the soil and of manual labor, above all the coffee tree in quasi-monoculture. Their exploitation lacks flexibility, notably because it does not permit distribution of the work over a long period, nor the prompt changes, that one can make with judicious choice of diverse annual cultures. In addition, they make a great demand on the aid of other cultivators, they do not feed either their manual labor, or their beasts and do not produce fertilizer.

It is necessary that practical colonization, more than these perennial cultures, carry on a system of annual cultures in rotation, or the rice will suffer. With rotation, the rice will have its place, as well as a fodder production.

Parallelly, the rice culture by ray must tend toward a rotation of annual cultures, giving, at least to begin with, a large place to the production of rice. This system must result in diminishing the duration of the forest fallow land, the surface areas of vagrant territory of the villages, the consumption of wood, that make the uprootings. It must tend to augment the productivity of the natives, by extending the uprooting cycles. Cultures judiciously combined must allow employment of manual labor all year long and avoid periods, where a gross supplementary manual labor is necessary everywhere at once. These massive and temporary needs have inevitably for effect excessive cost prices and do not avoid creating a social and even a political problem.

This system must have for objective the rational putting in culture of the best lands of the plateaus and moderate hills, with the obligatory alternation of clean and dirty plants, of plants with superficial and deep roots, of exhausting cultures and enriching cultures and with periodic fertilizing. Of this sort, yields will be far superior to those that one has a tendency to hope for from the "transformation in rice fields" of marshy bottom lands.

Some "experiences" of the transplanted inundated rice fields, made for the enhancing of certain bottom lands, in particular by the Inspectors of the Indochinese Guard employing to this effect their guards, their prisoners and, on occasion, some mountaineers in the environs of their post, could make one think that therein lies truly the best method of cultivating rice.

But I am not of this opinion. The returns of these "experiences" hardly permits one to judge them with accuracy. The experimenter, full of good will but lacking elements, noted no importance, the surfaces are approximated, the name and origin of the seeds employed are missing. But it is evident that, convinced of the superiority of his method, he employed his authority in assuring his triumph. His power over a small collectivity, the extraordinary work of his manual labor strictly supervised and free, his ardor and his enthusiasm must be considered as the surest cause of his conclusion. That which one can verify is that the rare rice fields thus created never held up after the departure of the creator, they disappeared and one never has observations on the maintenance, the augmentation or the diminution of the yields after a prolonged culture.

Surely, it is necessary to encourage the culture of rice fields managed by the villages, which is the practice; they are very well cultivated although not transplanted, which is not necessarily a fault. One could perhaps try it, but with prudence, as an extension method. But the true mode of culture of these regions is

High Donnai (Vietnam) Plantation of tea
growers

culture by ray, whose yield is known to be superior to that of the rice field; evidently, the fertility can and must be maintained or re-established other than by a long forest fallow. Research must support these alterations, which will maintain the fertility of the soil in not interrupting or very little its productivity. The bottom lands, if they must be cultivated, will do better in green fodder.

COMPARISON WITH CAMBODIA

Dry culture of rice is also practiced in a few regions of Cambodia. The comparison between rice in irrigated rice fields and rice dry recalls certain observations that one can make in this country.

Vast regions of Cambodia are constituted by very slightly inclined soils, of almost no relief, silico-muddy or muddy-silicious of beige or very light pink color, generally permeable but very slowly. They are indifferently covered over by characteristic light forest or by the rice field, both formations extending on considerable continuous surfaces; one also finds villages in the forest, where the rice is cultivated in the clearings.

He, who would penetrate the Cambodia, for example by the Eastern frontier, and directed himself toward the Bassac, would have the impression of observing a curious evolution of the culture of rice.

In the first hamlets that he crosses, he finds few permanent rice fields: these are established in the small clearings and occupy the middle part of slight depressions that the terrain presents. Dominated everywhere by the forest, after the rains set in, sufficient and fertilizing water, the bottom of the thalweg serves as an exutory and permits a continual renewal, these small rice fields also have excellent yields.

Outside of these permanent rice fields, one finds numerous "chamcars" dispersed in a radius of 5 to 10 km. around the village. These chamcars are nothing other than rays, but poorly done rays, the trees were not cut down, there are numerous roots incompletely consumed by the burning of the brush. The maize culture and above all the rice is carried out dry, by a random seeding, between the remains of the primitive vegetation and on a soil that undergoes no preparation the first year. If the culture continues in the years following, the soil is worked and progressively removed. The duration of these fields is very variable and depends above all on the whim and the courage of the cultivator, in fact the repeated culture unites with the action of natural agents to make the rest of the primitive vegetation disappear, but on the other hand the casual vegetation invades more and more and the soil becomes degraded, often one lets it be

overtaken in order to begin again the burning without waiting for the trees to develop.

The forest around the village shows numerous abandoned chamcars, invaded by a thin underbrush easier to clear with a machete and by fire than the true forest, one returns there well in advance before it becomes reconstituted. One can also recognize the location of old chamcars long after the villages were abandoned.

The clearings nor the abandonments are put under any rule, one takes the land or one leaves it alone according to his needs or his own whim. It sometimes happens that a village disappears or moves a few kilometers, but it is more to flee the malediction of an epidemic or a famine or some quarrel than by system or feeling of need to renew the cultivated terrains.

In proportion as the traveler advances toward the center of the country the villages become more important and a little more dense. The clearings managed in permanent rice fields grow larger, become contiguous to form only great rice fields where all worry of relief, of dominating forest or exutory has disappeared, dikes assure the retention of water in small bins. The fertility feels the effects of it, the borders are rich but the rest has only very mediocre value of the great rice field plains of the country. The surrounding chamcars appear more and more like the first phase of the extension of the principle gap, the clearings far from the village are rarer, while the neighboring ones are more rendered to brush; one clears, one cultivates in the same manner in the course of the first years; at the end of five or six years one transforms them in inundated rice fields in surrounding them by dikes that retain the water.

When the forest ceases to make place for the cultivated plain, it seems only that one arrives at a clearing without end, where the successive extensions finished by rejoining and where the spontaneous vegetation is no longer represented except by brushy islets.

The transition from the forest to permeable soil to the inundated rice field, by the intermediary of dry, more or less temporary cultures accompanies it with modifications of the soil structure. This evolution was observed on an experimental station of the Indochinese Rice Office at Cambodia. The natural soil, covered by forest or brush is deep, it is perfectly permeable although slowly and is not at all marshy, even in full rainy season, except evidently in the bottom lands. A perfect clearing, completed by an equipping with bins surrounded by dams, does not suffice to make appear the aptitude of retaining the surface water, characteristic of the classical rice field. On the new lands the dry culture, analogous to that of the rays or the chamcars, is only possible. It is the continual repetition of the culture, that makes an impermeable level appear, at the

same time furthermore as the fertility diminishes. A clearing cultivated dry, that had a yield per unit of 3 tons the second year, which is the best one, becomes at the end of five years an ordinary rice field, that produces with great difficulty one ton when the year's climate is favorable.

One avoids, or one retards considerably this double phenomenon . . . when one allows the soil to rest and the brush to invade it in the course of a long fallow, this is the system of chamcar of the forester villages.

One even verifies a certain reversibility: rice fields cleared a few years ago, worn out, but still completely impermeable and which for this fact were excessively sensitive to the dryness, were cultivated "dry" after the application of a strong organic fertilizer. The success was very clear. The popularization of the system, with strong fertilizers and the use of green dung instead of fallow, had begun when the war of 1939 came into being.

Numerous varieties of rice from Cambodia lend themselves equally well to two cultures, everything happens as if the conditions, that the plant finds in the very first days of its vegetation, decide its aptitudes and its ulterior needs. With this particularity, every time that the yields of the dry culture are very affected by the fertility and the structure of the soil; in terrains that are rich and deep, they are very superior in the dry culture than in the inundated rice field; but, in the worn out and degraded terrains, the dry culture can yield nothing while the seeding in the inundated rice field gives, if one can say so, still economical yields.

It is perhaps too simple a way in which one associates the idea of the culture of rice to that of bottom lands or swamps.

Rice is an admirable Grass. It is the only one capable of pulling profit from lands, which present paradoxical agricultural conditions, as these regions, that water invades each year under a depth going from a few centimeters to 3 meters or more, or else these plains of Cambodia, having arrived at such a degree of poverty and degradation, that not one plant could get any advantage from the soil, while rice still succeeds in furnishing 500 to 700 kg of grain per hectare and per year.

REMARKS. — Study of the conditions of the rice culture of the mountaineers of South Vietnam. The author underlines, particularly, the equilibrium attained between the modes of culture followed and the economic value of the fertility of the soil.

Comparison with the cultures of rice in "chamcars" in Cambodia.